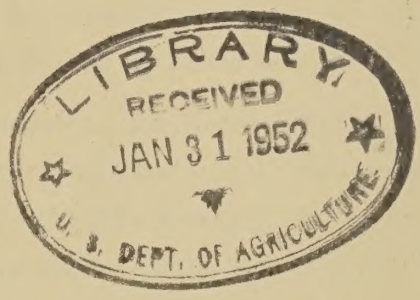
REPORT ON FIELD TESTS
OF
HENRY PHASE CONVERTER



U. S. DEPARTMENT OF AGRICULTURE
RURAL ELECTRIFICATION ADMINISTRATION
TECHNICAL STANDARDS DIVISION

REPORT ON FIELD TESTS
OF
HENRY PHASE CONVERTER

Field tests were made on the Henry Phase Converter during the week of February 19, 1951, in cooperation with the Magic Valley Electric Cooperative, Mercedes, Texas.

The Henry Phase Converter operates a three-phase motor as a capacitor start--capacitor run motor. Capacitor switching as shown in the diagram is used to gain additional starting torque.

Three tests were conducted; the first on a 7 1/2 hp installation of a Henry Phase Converter, a three-phase motor and a directly connected centrifugal pump; the second on a 5 hp installation of a Henry Phase Converter, a three-phase motor and a belt driven impeller pump; and a third on the same pump but driven by a single-phase 5 hp motor.

The comparison of the 5 hp single-phase motor with the 5 hp three-phase motor on the same pump installation provided valuable information. Summarizing the data taken from the tests and adjusting the input to the single-phase motor for the difference in pump speeds (power requirements vary to the cube of the pump speed) the comparisons given on page three were calculated.

The data taken on the 7 1/2 hp three-phase pump was inconclusive as the pump did not remain under constant loading, making it impossible to get accurate readings throughout the tests. However, the summary of this information is also given on the data page.

The tests indicate that where starting torques are moderate, the Henry Phase Converter permits the operation of three-phase motors on single-phase lines. The power input to the converter is at a very good power factor. The line starting surge to the converter installation is considerably lower than that of the comparable single-phase motor installation. However, the converter surge is longer in duration. How this would affect other consumers on the same line would depend on the size of the conductor, length of circuit, and amount of load the line was carrying. It is doubtful that the longer time of the surge is sufficient to offset the benefits of the reduced amplitude.

The technical operation of the converter appears to be satisfactory. The use of the converter and three-phase motors should permit across the line starting of motors at least one size larger than now permitted on single-phase motors. If 5 hp single-phase motors are now permitted on direct starting, 7 1/2 hp three-phase motors with converters could be started the same way with no additional starting surge trouble.

As stated in an earlier report (1), the Henry Phase Converter does not bear evidence of Underwriters' Laboratories, Incorporated, approval. It therefore should not be recommended for use on REA systems.

If and when the device is approved by the Underwriters' Laboratories, Incorporated, its use may not necessarily be sanctioned by motor manufacturers. The responsibility for its application should lie entirely with the consumer and with the phase converter manufacturer.

(1) Report On Henry Phase Converter, August 1950. Technical Standards Division Rural Electrification Administration, United States Department of Agriculture, Washington 25, D. C.

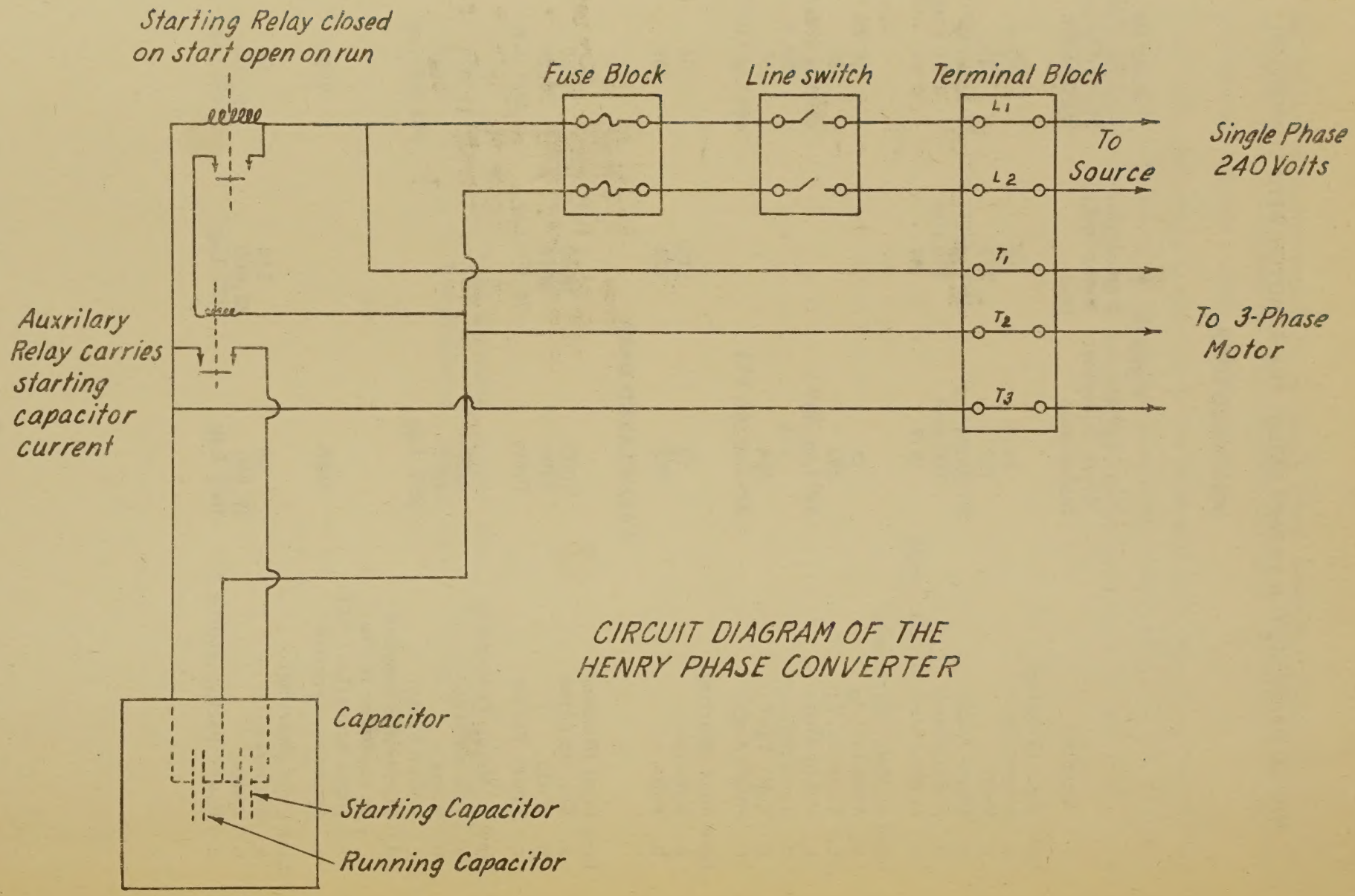
SINGLE PHASE MOTOR VERSUS THREE PHASE MOTOR WITH CONVERTER

MEASURED DATA

Quantity	Pump No. 1 5 hp, 3 phase Motor-Converter Installation	Pump No. 1 5 hp, 1 phase Motor Installation	Pump No. 2 7 1/2 hp, 3 phase Motor-Converter Installation
Line Input (Running)			
a. Amperes	21.5	43	32.3
b. Volts	232	223	239
c. Phase Angle	0° (Unity)	40° Lag (76.6%)	6° Lag (99%)
d. Pump Speed	700 rpm	780 rpm	1720 rpm
e. Motor rated current, amps	13.7	34	19
Input at Motor Terminals			
a. Amperes, I_2	13		15.8
b. Volts T_2-T_1	262		226
c. Phase Angle	34° Lag (83%)		27° Lag (89.1%)
d. Amperes, I_3	7.4		29.5
e. Volts T_3-T_1	234		255
f. Phase Angle	27° Lag (89.1%)		60° Lag (50%)
Line Input (Starting)			
a. Amperes	58	110	94
b. Volts	232	223	239

CALCULATED DATA

Line Input (Running)			
a. Volt-amperes	5000	6640	7720
b. Watts	5000	5080	7620
c. Power Factor	Unity	76.6% Lag	99% Lag
Input at Motor Terminals			
a. Volt-amperes	5137		11,093
b. Watts	4372		6940
c. Power Factor	85% Lag		62.5% Lag
d. Correction supplied by capacitor in the phase converter, volt-amperes, reactive	2680		7865
Line Input (Starting)			
a. Amperes	58	110	94
b. Watts	12,800	22,000	16,000
c. Power Factor (approx.)	94% Lag	85% Lag	71% Lag



CIRCUIT DIAGRAM OF THE
HENRY PHASE CONVERTER